

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API STD 598 (1990) Valve Inspecting and Testing

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ANSI/ASME B1.2 (1983; Errata 1992) Gages and Gaging for Unified Inch Screw Threads

ANSI/ASME B40.1 (1991; Special Notice 1992) Gauges - Pressure Indicating Dial Type – Elastic Element

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1010 (1982) Water hammer Arresters

ASSE 5000 (1991) Professional Qualifications Standards, Backflow Prevention Assemblies

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1785 (1994) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D 2241 (1994) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)

ASTM D 2464 (1994) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D 2466 (1995) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D 2564 (1993) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems

ASTM D 2855 (1993) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C500	(1993; Addendum 1995) Metal-Seated Gate Valves for Water Supply Service
AWWA C511	(1992) Reduced-Pressure Principle Backflow-Prevention Assembly
AWWA C651	(1992) Disinfecting Water Mains
AWWA M14	(1990) Backflow Prevention and Cross-Connection Control

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-2745	(Rev. A) Sprinkler, Lawn
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FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR-USC	List of Approved Backflow Prevention Assemblies
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NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2	(1993) Industrial Control and Systems Controllers, Contactors and Overload Relays, Rated Not More than 2000 Volts AC or 750 Volts DC
NEMA ICS 6	(1993) Industrial Control and Systems Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1999) National Electrical Code
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NSF INTERNATIONAL (NSF)

NSF 14	(1990) Plastic Piping Components and Related Materials
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PLASTICS PIPE INSTITUTE (PPI)

PPI TN8/8	(1973) Making Threaded Joints with Thermoplastic Pipe & Fittings
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UNDERWRITERS LABORATORIES INC. (UL)

UL 651	(1995) Schedule 40 and 80 Rigid PVC Conduit
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1.2 SYSTEM DESCRIPTION

This system is designed with a water pressure minimum of 80 pounds per square inch (psi) and maximum of 100 psi at connection to main backflow prevention device and 50 psi at the last head in each zone. If pressure falls above or below indicated values, Contractor shall notify Contracting Officer.

1.3 SUBMITTALS

Submit the following in accordance with Division 1, Section 01330, "Submittal Procedures."

1.3.1 SD-02, Manufacturer's Catalog Data

- a. Piping materials, tubing, and fittings
- b. Valves and accessories
- c. Sprinkler heads
- d. Backflow preventers
- e. Automatic controller
- f. Solvent cement
- g. Control wiring
- h. Water hammer arresters
- i. Tapping tee
- j. Valve boxes and lids

1.3.2 SD-04, Drawings

- a. As-built drawings indicating final layout of system.

1.3.3 SD-06, Instructions

- a. Automatic controller
- b. Sprinkler heads
- c. Piping materials, tubing and fittings
- d. Backflow preventers
- e. Valves
- f. Solvent cement
- g. Control wiring

- h. Water hammer arresters

1.3.4 SD-12, Field Test Reports

- a. Pressure test
- b. Operation test including verification of sprinkler head layout

Submit record of pressure tests conducted on recording gage.

1.3.5 SD-13, Certificates

- a. Backflow preventers

ASSE 5000, Submit a certificate of Full Approval or a current Certificate of Approval from FCCCHR-USC for size, and make of backflow preventer being provided for this project. A Certificate of Provisional Approval will not be acceptable.

1.3.6 SD-18, Records

- a. Controller Charts

1.3.7 SD-19, Operation and Maintenance Manuals

- a. Piping materials and fittings, Data Package 2
- b. Sprinkler heads and accessories, Data Package 2
- c. Backflow preventers, Data Package 2
- d. Valves, Data Package 2
- e. Automatic controller, Data Package 2
- f. Water hammer arresters, Data Package 2

Submit operation and maintenance data in accordance with Division 1, Section 01781, "Operation and Maintenance Data." Include troubleshooting procedures with respect to valve and controller problems.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver materials in original rolls, packages, cartons, and containers with the name of manufacturer, brand, and model. Inspect materials delivered to the site for damage.

1.4.2 Storage

Store materials on site in enclosures or under protective covering. Store plastic piping and rubber gaskets under cover out of direct sunlight. Do not store materials directly on ground. Keep inside of pipes and fittings free from dirt and debris.

1.4.3 Handling

Handle and carry pipe, fittings, valves, and accessories in such a manner as to ensure delivery to trench in sound undamaged condition. Do not drag pipe.

1.5 EXTRA STOCK

- a. 2 additional sprinkler heads (nozzles, bodies, screens, pressure compensating devices) of each size and type;
- b. 2 valve keys for operating manual valves;
- c. 2 wrenches for removing and installing each type of head;
- d. 2 quick coupler keys and hose swivels;
- e. 4 irrigation controller housing keys.
- f. 4 irrigation controller enclosure keys; and

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

2.1.1 Galvanized Steel Pipe and Associated Fittings

2.1.1.1 Pipe

ASTM A 53, Schedule 40.

2.1.1.2 Fittings

- a. Fittings shall be Class 150 with a pressure rating of 150 psi at 350 degrees F.

ANSI/ASME B16.3, Class 150, ASTM A53.

2.1.2 Polyvinyl Chloride (PVC) Pipe, Fittings and Solvent Cement

NSF 14, seal of approval for potable water.

2.1.2.1 Pipe

ASTM D 1785, PVC 1120 Schedule 40 and 80; or ASTM D 2241, PVC 1120 SDR 21, Class 200.

2.1.2.2 Fittings

- a. Solvent Welded Socket Type: ASTM D 2466, Schedule 40.
- b. Threaded Type: ASTM D 2464, Schedule 80.

2.1.2.3 Solvent Cement

ASTM D 2564.

2.1.3 Pipe Sleeving

- a. Provide PVC piping two times the diameter of main or lateral piping.
- b. Provide grey PVC electrical conduit sized according to number of control wires. Minimum 2 inch size.

2.2 IRRIGATION HEADS

CID A-A-2745.

2.2.1 Fixed Riser Irrigation Heads

2.2.1.1 Gear Rotor Irrigation Head, Full or Part Circle

As specified on the Drawings, or equal.

2.2.1.2 Pressure Compensating Flood Bubbler Head

As specified on the Drawings, or equal.

2.2.2 Pop-Up Irrigation Head

As specified on the Drawings, or equal.

2.3 VALVES

2.3.1 Gate Valves, 3 Inches and Larger

As specified on the plans, or equal.

2.3.2 Control Valves

2.3.2.1 Master Control Valve

As specified on the plans, or equal.

2.3.2.2 Remote Control Valve, Electrical

Solenoid actuated globe valves of 20 to 51 mm, 3/4 to 2 inch size, alternating current (ac), 50 cycle amps in rush current.

2.3.3 Backflow Preventers

2.3.3.1 Reduced Pressure Type Backflow Preventers

AWWA C511. Provide backflow preventers complete with 150 psi rated flanged brass mounted ball valve and strainer, 304 stainless steel or bronze, internal parts. Total pressure drop through complete assembly shall be a maximum of 10 psi at rated flow. Listing of particular make, model/design, and size in FCCCHR-USC will be acceptable as required proof for testing and certification.

- a. Piping Assembly: Galvanized pipe and fittings.
- b. Strainers: Bronze or brass construction with gasket caps. Equip units with No. 100 mesh stainless steel screen elements.

2.4 ACCESSORIES AND APPURTENANCES

2.4.1 Valve Boxes

Plastic valve box for each isolation valve, control valve, quick coupling valve and drain valve. Provide box as specified on the Drawings, or equal.

- a. Cast the word "IRRIGATION" on cover.
- b. Stencil, engrave, or brand controller and valve sequence on remote control valve cover. Letters minimum 4 inches height.

2.4.2 Backflow Preventer Accessories

2.4.2.1 Pressure Gages

ANSI/ASME B40.1, single style pressure gage for water with 1/2 inch dial, brass or aluminum case, bronze tube, gage cock, pressure snubber, and siphon. Provide scale range suitable for irrigation systems.

2.4.2.2 Backflow Preventer Enclosure

As specified on the Drawings or equal.

2.4.2.3 Concrete Pads

Cast-in-place reinforced concrete construction for reduced pressure type backflow preventers.

2.4.2.4 Piping and Fittings

Piping and fittings to be flanged spools of Schedule 40 steel and Class 150 weld flanges, hot dipped galvanized after fabrication. Spacer spools to be welded and galvanized. Companion flanges at suction and discharge header connections to be Schedule 40 steel and galvanized.

2.4.2.5 Gages

Gages shall be 1/2 inch diameter, liquid filled for vibration dampening, 0-200 pounds, stainless steel casing, with brass needle valve shut-off cocks.

2.5 AUTOMATIC CONTROLLER ELECTRICAL

Controller with 120-volt single phase service, operating with indicated station, and grounded chassis. Provide enclosure with locking hinge cover, wall mounted.

2.5.1 Controller Features

- a. As specified on the Drawings, or equal.

2.6 ELECTRICAL CIRCUITS

2.6.1 Control Wiring for Electrically Operated Valves

NFPA 70, copper conductor 14 gage at control wire, 12 gage at common wire, Type UF.

2.6.2 Conduit

UL 651, rigid polyvinyl chloride conduit, Schedule 40.

2.7 CONCRETE MATERIALS

2500 psi compressive concrete strength at 28 days as specified under Division 3, Section 03300, "Cast-In-Place Concrete".

PART 3 - EXECUTION

3.1 INSTALLATION

Install sprinkler system after site grading has been completed.

3.1.1 Trenching

Hand trench around roots to pipe grade when roots of 2 inches diameter or greater are encountered. Make width of trench 4 inches minimum or 1 1/2 times diameter of pipe, whichever is wider. Backfill and hand tamp over excavation. When rock is encountered, excavate 4 inches deeper and backfill with silty sand (SM) or well-graded sand (SW) to pipe grade. Keep trenches free of obstructions and debris that would damage pipe. Do not mix subsoil with topsoil. Bore under existing concrete walks, drives and other obstacles at a depth conforming to bottom of adjacent trenches. Install pipe sleeve, two pipe diameters larger than sprinkler pipe, to fill bore. Prior to backfilling of trench, Contracting Officer shall verify and approve location of all irrigation heads.

3.1.2 Piping System

3.1.2.1 Clearances

- a. Minimum horizontal clearances between lines: 4 inches for 2 inch pipe and less; 12 inches for 2 inch pipe and more.

- b. Minimum vertical clearances between lines: One inch.

3.1.2.2 Thrust Blocks

Install thrust blocks at bends, tees, plugs and valves or 2 1/2 inches and larger mainline piping. Place concrete so that sides subject to thrust or load are against undisturbed earth, and valves and fittings are serviceable after concrete has set.

3.1.2.3 Minimum Backfill Cover

- a. 18 inches for pressure mainline pipe and valve control wire.
- b. 18 inches for non-pressure lateral pipe.
- c. Install pipe sleeves at depths indicated in "a" and "b".

If rock is encountered, provide minimum 4 inches of silty sand (SM) or well graded sand (SW) cover on top of all piping. Fill remainder of trench or pipe cover to within 3 inches of top with excavated soil, and compact soil with plate hand-held compactors to same density as undisturbed adjacent soil.

3.1.3 Piping Installation

3.1.3.1 Polyvinyl Chloride (PVC) Pipe

- a. Solvent-Cemented Joints: ASTM D 2855.
- b. Threaded Joints: PPI TN8/8; full cut with a maximum of three threads remain exposed on pipe and nipples. Make threaded joints tight without recourse to wicks or fillers, other than polytetrafluoroethylene thread tape.
- c. Piping: ASTM D 2774 or ASTM D 2855, and pipe manufacturer's instructions. Install pipe in a serpentine (snaked) manner to allow for expansion and contraction in trench before backfilling. Install pipes at temperatures over 40 degrees F.

3.1.3.2 Threaded Brass or Galvanized Steel Pipe

Prior to installation ream pipe. Cut threads as specified in ANSI/ASME B1.2. Make joints with pipe joint compound applied to male end only.

3.1.4 Irrigation Heads

Install plumb and level with terrain.

3.1.4.1 Fixed Riser Irrigation Heads

Install per details on the Drawings.

3.1.4.2 Pop-Up Irrigation Head

Install per details on the Drawings.

3.1.5 Valves

3.1.5.1 Isolation Valves

Install per details on the Drawings.

3.1.5.2 Control Valves

Install per details on the Drawings.

3.1.6 Backflow Preventers

a. Install backflow preventer in new connection to existing water distribution system, between connection and control valves. Install with concrete pads.

b. Flush pipe lines prior to installing device.

c. Device shall not be installed in pits or where any part of the device could become submerged in standing water

d. Install device a minimum of 12 inches from trees, walls, fences, structures and other obstructions.

3.1.7 Accessories

3.1.7.1 Valve Boxes and Lids

a. Install per details on the Drawings.

3.1.7.2 Backflow Preventer Enclosure

a. Install with concrete pad.

b. Place hinges so direction of swing will not conflict with other site features.

3.1.8 Electrical Circuits

Bury wires beside mainline pipe in same trench. Provide grey electrical conduit where wires run under paved or non-paved pedestrian paths and vehicular roads. Tag wires at controller and control valve location with plastic tie wrapped tags. Provide one control wire to each control valve location and one common wire looped from controller to each control valve. Provide one separate control valve wire of a different color from controller to each control valve cluster.

3.1.8.1 Loops

Provide a 24 inch loop of wire at each valve where controls are connected.

3.1.8.2 Expansion and Contraction

Bundle multiple tubes or wires and tape together at 10 foot intervals with 12 inch loop for expansion and contraction.

3.1.8.3 Splices

Make electrical splices waterproof. Locate all field electrical splices in valve boxes.

3.1.9 Automatic Controller

Determine exact location of controllers in field before installation. Coordinate the electrical service to these locations. Install in accordance with manufacturer's recommendations and NFPA 70.

3.1.10 Flushing

After piping, risers, and valves are in place and connected, but prior to installation of sprinkler heads and valves, flush piping system under a full head of water. Maintain flushing for 3 minutes.

3.1.11 Adjustment

After grading, plant installation, and rolling of planted areas, adjust sprinkler heads flush with finished grade. Make adjustments by providing new nipples of proper length or by use of heads having an approved device, integral with head, which will permit adjustment in height of head without changing piping.

3.2 FIELD QUALITY CONTROL

The Contractor will conduct and the Contracting Officer and the QC representative will witness field inspections and field tests specified in this section. Perform field tests, and provide labor, equipment, and incidentals required for testing.

3.2.1 Pressure Test

3.2.1.1 Duration

During pressure test, maintain a hydrostatic pressure of 100 psi without pumping for a period of one hour.

3.2.1.2 Leaks

Correct leaks. Make necessary corrections to stop leakage.

3.2.1.3 Retest

Retest system twice until pressure can be maintained for duration of test.

3.2.2 Operation Test

3.2.2.1 Accessories

At conclusion of pressure test, install irrigation heads or drip heads, quick coupling assemblies, and hose bib, and test entire system for operation under normal operating pressure. Make necessary corrections or adjustments to raise or lower pressure for each system if tests results do not match pressure requirements.

3.2.2.2 Acceptance

Operation test is acceptable if system operates through at least one complete cycle for areas to be irrigated.

3.2.3 Controller Charts

Provide one chart for each controller supplied. Indicate in chart area controlled by automatic controller. The chart is a reduction of the actual plan[s] that will fit the maximum dimensions inside controller housing. Use black line print for chart and a different pastel or transparent color to indicate each station area of coverage. After chart is completed and approved for final acceptance, seal chart between two 20 mil pieces of clear plastic.

END OF SECTION